What is claimed is:

1. A plasma etch process for selectively etching a layer of low-k dielectric material having a dielectric constant less than 4, comprising:

introducing into a plasma etch chamber, in which the layer of low-k dielectric material is situated, an etching gas mixture comprising a fluorine-rich fluorocarbon or hydrofluorocarbon gas, a nitrogen-containing gas, and a hydrogen-rich hydrofluorocarbon gas; and

maintaining a plasma of the etching gas mixture in the plasma etch chamber to etch the layer of low-k dielectric material.

2. The process of claim 1 wherein the fluorine-rich fluorocarbon gas is CF_4, the nitrogen-containing gas is N_2, and the hydrogen-rich hydrofluorocarbon gas is selected from the group consisting of CH_2F_2, CH_3F, and mixtures thereof.

3. The process of claim 1 wherein the plasma of the etching gas mixture etches the low-k dielectric layer with an etch rate higher than about 4000 Å/min.

4. The process of claim 1 wherein the fluorine-rich fluorocarbon or hydrofluorocarbon gas is selected from the group consisting of CF_4, C_2F_8, CHF_3, and mixtures thereof.

5. The process of claim 1 wherein the nitrogen-containing gas is selected from the group consisting of N_2, NH_3, NF_3, and mixtures thereof.

6. The process of claim 1 wherein the hydrogen-rich hydrofluorocarbon gas is selected from the group consisting of CH_2F_2, CH_3F, and mixtures thereof.

7. The process of claim 1 wherein the etching gas mixture is introduced into the plasma etch chamber by introducing the fluorine-rich fluorocarbon or hydrofluorocarbon gas at a first volumetric flow rate, the nitrogen-containing gas at a second volumetric flow rate, and a hydrogen-rich hydrofluorocarbon gas at a third

volumetric flow rate, and wherein the ratio of the second volumetric flow rate to the first volumetric flow rate is about 1:4 to 2:1.

8. The process of claim 1 wherein the etching gas mixture is introduced into the plasma etch chamber by introducing the fluorine-rich fluorocarbon or hydrofluorocarbon gas at a first volumetric flow rate, the nitrogen-containing gas at a second volumetric flow rate, and a hydrogen-rich hydrofluorocarbon gas at a third volumetric flow rate, and wherein the ratio of the third volumetric flow rate to the first volumetric flow rate is about 1:3 to 1:1.

9. The process of claim 1 wherein the layer of low-k dielectric material is over a substrate placed on a pedestal in the plasma etch chamber, and maintaining a plasma of the etching gas mixture comprises capacitively coupling RF power into the plasma etch chamber such that a substantial DC bias exists between the pedestal and the plasma.

10. The process of clam 1 wherein the layer of low-k dielectric material is over a substrate placed on a pedestal in the plasma etch chamber, and maintaining a plasma of the etching gas mixture comprises:

applying a bias power to the pedestal; and

applying a source power to a top electrode facing the pedestal, wherein the source power has a frequency higher than a frequency of the bias power.

11. The process of claim 1 wherein maintaining a plasma of the etching gas mixture further comprises applying a slowly rotating magnetic field in the chamber.

12. The process of claim 1 wherein the etching gas mixture further comprises an inert gas selected from the group consisting of argon, helium, neon, xenon, and krypton.

13. The process of claim 12 wherein the etching gas mixture is introduced into the plasma etch chamber by introducing the fluorine-rich fluorocarbon or hydrofluorocarbon gas at a first volumetric flow rate, and the inert gas at a second

volumetric flow rate, and wherein the ratio of the second volumetric flow rate to the first volumetric flow rate is about 20:1 to 50:1.

14. A computer readable medium storing therein program instructions that when executed by a computer causes an etch reactor to etch a layer of dielectric material having a dielectric constant less than 4.0, the program instructions comprising:

providing a substrate with the layer of low-k dielectric material thereon into a plasma etch chamber of the etch reactor;

introducing into the plasma etch chamber an etching gas mixture comprising a fluorine-rich fluorocarbon or hydrofluorocarbon gas, a nitrogen-containing gas, and a hydrogen-rich hydrofluorocarbon gas; and

striking a plasma of the etching gas mixture in the plasma etch chamber to etch the layer of low-k dielectric material.

15. The computer readable medium of claim 14 wherein the substrate is placed on a pedestal in the plasma etch chamber, and wherein striking a plasma of the etching gas mixture comprises capacitively coupling RF power into the plasma etch chamber such that a substantial DC bias exists between the pedestal and the plasma.

16. The computer readable medium of claim 14 wherein striking a plasma of the etching gas mixture comprises supplying a RF bias power to the pedestal and supplying a VHF power to a top electrode facing the pedestal.

17. A method for creating damascene or dual damascene structures, comprising:

introducing into a plasma etch chamber a substrate coated with a layer of low-k dielectric material having more than 8% carbon content;

introducing into the plasma etch chamber an etching gas mixture comprising a fluorine-rich fluorocarbon or hydrofluorocarbon gas, a nitrogen-containing gas, and one or more additive gases;

maintaining a plasma of the etching gas mixture in the plasma etch chamber to etch the layer of low-k dielectric material.

18. The method of claim 17 wherein the fluorine rich fluorocarbon gas is selected from the group consisting of CF_4, C_2F_8, CHF_3, and mixtures thereof.

19. The method of claim 17 wherein the additive gases include one of a hydrogen-rich hydrofluorocarbon gas, an inert gas, and a carbon-oxygen gas.

20. The method of claim 17 wherein the substrate is placed on a pedestal in the plasma etch chamber, and wherein maintaining a plasma of the etching gas mixture comprises supplying a RF bias power to the pedestal and supplying a VHF power to a top electrode facing the pedestal.